INFORMATION THEORY OF THE FIRM

by

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ABSTRACT

The purpose of this thesis is to explain the role of information in the theory of the firm. This provides a new perspective on how information impacts firm expansion and boundary. Information helps a firm become more certain on how to direct the firm. Uncertainty is the opposite; it causes confusion and problems for the firm. This thesis discusses two ways a firm can develop certainty. The first is through experience and learning. These may require time and effort. The second is through expansion. Expansion increases resources and capacity for the firm to deal with uncertainty. Certainty is manifest as operational intelligence and stability. Operational intelligence is based largely on how the firm operates and stability focuses on the current position of the firm. These two elements of certainty determine the firm boundary.

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CHAPTER 1

INTRODUCTION

The purpose of this thesis is to explain the role of information in the theory of the firm. In the context of this thesis, information is any internal or external data of value to the firm. It is the learning curve of production, firm environment, teamwork, data, experience, and anything that increases information or familiarity for the firm. Information is also trade secrets, operating procedures, proprietary information, and any other information that gives the firm a competitive edge in the market and helps reach profit maximization. It is the information that is distinct to the function of the firm and would jeopardize the market share of the firm if lost to a competitor. Information can also serve as a competitive advantage for the firm, and most firms attempt to protect this information with great effort.

Information helps explain why firms expand or choose not to expand. In the literature review, the theories reviewed attempt to capture the broad range of concepts that seek to explain firm theory. Each theory puts some emphasis on controlling resources. The resource that is argued in this thesis is information.

For the purposes of this thesis, entrepreneur will be used as a blanket term to include corporations, individuals or any other group that starts a firm. This is because it

will make the argument easier to follow and does not affect the basic argument. Similarly, we can substitute the idea of a corporation forming the firm. Firms within this thesis are presented in a general term, but a firm can take the form of a limited liability company, limited liability partnership, sole proprietorship, general partnership, corporation, and various other classifications. This is not an exhaustive list of what is or is not a firm, and for the purposes of this thesis, any firm is a business. A business entity sells or produces goods or services for the market.

A major focus of this thesis is expansion of firms. Expansion helps firms gain additional information. As a firm expands operations, it incorporates resources that add information to the firm and also increase the overall capacity of the firm to handle information. These resources range from accounting professionals' knowledge to assembly teams, and even extend to raw and prefabricated materials. The tradeoff between using the market and internalizing operations forms the firm boundary. This is a make-or-buy decision often decided by upper management within a firm. Hence, the firm boundary is the area of current operations, or more simply the area at which the firm ends operations.

The make-or-buy decision is largely determined by uncertainty. Uncertainty will be discussed at great length in this thesis, but for the moment, uncertainty is lack of information. Uncertainty increases the firm's likelihood of making bad decisions, delaying or preventing a firm from making operational decisions, increasing volatility for the firm, or possibly causing the firm to poorly allocate resources. If the firm decides to outsource production because of uncertainty, then it accepts the inherent risks that come from outsourcing. On the other hand, through acquisition or expansion, the firm is

adding information and capabilities that help it reduce uncertainty. Expansion offers the firm more resources and certainty.

Certainty, in this thesis, is manifest as operational intelligence and stability, both of which are forms of certainty that allow the firm to operate with higher information. Increased operating intelligence is key to a firm being successful. Essentially, this is more calculated decisions and better understanding of the firm in the marketplace. This includes the external and internal environment of the firm, the capabilities of the firm, and potential opportunities for the firm.

Stability is how well the firm can forecast future events. For example, a firm may operate with high seasonal fluctuations. If these fluctuations match the expectations of the firm, then volatility may be considered low even though the fluctuations are high. Fundamentally, stability is how closely aligned the expected operations and actual operations are by the firm.

If the firm is poor at forecasting, then the firm has instability and will likely devote resources to stabilization. This can be costly to the firm, as it tries to devote resources to deal with instability. Volatility can occur from internal errors or problems created by the firm. Also, volatility can occur from external sources, such as the market. Volatility can disrupt the physical and strategic operations of the firm. The presence of volatility causes uncertainty for the firm.

Uncertainty from volatility or poor operational intelligence by a firm adversely impacts the firm's expansionary decisions. In states of high uncertainty, a firm is more likely to refrain from expansionary decisions. This is due to the potential risks that

expansion poses to the firm such as increased costs or jeopardizing the survival of the firm.

CHAPTER 2

LITERATURE REVIEW

The following subjects are discussed in the literature review "Theory of the Firm," production efficiency, transaction cost, transfer pricing, and asymmetric information. The ideas presented in this thesis focus on the role of information in firm development, behavior, and growth. Information is key to firm theory because it is the basis to any decision made by a firm. This will be discussed at greater length in the following chapters, but for this chapter, the focus is on developing information.

Each article in the literature review has ideas that explain or abstractions that can be drawn about how information works in an economic setting. Some of the ideas of this thesis derive from the articles through parallels or abstractive thinking that come from the original concept found in the article. The focus for the literature review is to cover the material with accuracy and notify the reader of any parallels or abstractions that are necessary for the later chapters.

Information is abundant in business. It is developed through interaction, experience, perception, or any other way that gathers information. One of the key arguments of this thesis is that information is used as the basis for decision-making. Aside from the previously mentioned sensory methods, there are other means by which

information can be obtained, some of which are discussed in the literature review.

Production efficiency, when used comparatively, can be used to generate information. The comparisons can be used as tools to help decision-makers in a firm choose how to direct the firm. Transaction costs and transfer pricing each provide information to the firm that is unique to how the firm is operating and can serve as measures for basing comparative efficiencies.[1] Lastly, asymmetric information is concerned with having assurance even though there is a lack of information. The important point being that even in the absence of information, a decision-maker has certainty in a likely outcome. These ideas serve as some of the key ways a firm gathers information.

Once again, how firms gather and use information is the basis for the theory of the firm being developed in this thesis. We will discuss various qualities of information, such as reliable or unreliable, and also extend the idea to how it is interpreted. These topics are discussed at greater length in the following chapters, but for the purposes of the literature review, ideas concerning information are presented in the literature as intended by the author, and then demonstrate how it is relevant to information.

2.1 Theory of the Firm

A unique feature of firm is that it uses coordination and control to produce an intended product. The approaches to "theory of the firm" discussed range from neoclassical, institutional, and resource-based. Within these schools of thought, the theories center around trying to explain why firms exist, what is a firm, or what are the

[1] The term efficiency in this thesis focuses on how well aligned a process or policy is with the overall goals of the firm.

limiting factors to a firm's growth. Information is key to a firm being successful, and firms pursue paths that allow for greater information. These theories are important to economic theory because we interact with corporations and other business entities daily. Understanding why firms develop and why economic growth is limited is key to understanding how the free enterprise and world economic system functions.

2.1.1 Wealth of Nations (1776)

Adam Smith in "Wealth of Nations" (1776) addresses the benefits that specialization can have on production. Specialization is a major component of firm theory because it can be an argument for why a firm exists. Firms can specialize by organizing labor with a purpose to reduce errors or waste, and increase production speed. The basic concept is that a specialized worker is better at judging production requirements, able to produce more quickly, and less likely to make errors. In the viewpoint of this thesis, specialization does two things: the worker is taught how to produce properly, and can offer efficiency recommendations for improvements. Specializing can be accomplished by reducing the task to the simplest process. Smith's theory is the basis for ideas involving production efficiency. Production efficiency argues, similar to Smith, that workers who specialize are more efficient. The argument is extended in production efficiency, in that the learning curve is the process to specialization.

Smith argued that the production process should be grouped according to divisions of labor. Within Smith's framework, a division of labor is a narrow focus on a single task of production. "The greatest improvement in the productive powers of labor,

and the greater part of the skill, dexterity, and judgment with which it is any where directed, or applied, seem to have been the effects of the division of labor" (Smith, 1776, p. 1). Within any given division of labor, the total production process should be divided amongst the laborers to the point that each portion of the production process is as simple as possible.[2]

The benefits of this are twofold: increased production efficiency and specialization. Production efficiency is where a firm eliminates any nonessential process from the production process. This may also come in the form of better organization in order to accomplish production and expedite the process. Specialization encourages the laborers to specialize in a specific area of the production process. By allowing laborers to specialize increases the skill[3] of the laborer to accomplish the task, and creates efficiency in the production process. Smith argues that coordinating how and where each laborer specializes in production allows for higher production efficiency than if the effort is uncoordinated and nonspecialized. As a result, production efficiency and specialization gained through coordination[4] allows the producer to gain real economical savings and increases speed of production. Although Smith never explicitly wrote his theory to be a firm theory, specialization is an important part of how firms function.

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[2] Basically, the goal is to organize production so only essential inputs are present in the production process and that any nonessential inputs are reassigned to other areas of production or removed entirely.

[3] The idea is that the laborer becomes better at production as they work through the learning curve and develop skills.

[4] Dividing and assigning the labor force.

2.1.2 Nature of the Firm (1937)

In Coase's "Nature of the Firm" (1937) he theorized that firms play a larger role in the economic system than many of his contemporaries realized. The common economic viewpoint was that natural forces largely control the economic system. The norm was that these forces, supply and demand, are what guide resources within an economy. The price mechanism is a manifestation of these forces and sets the prices of goods and services within the economy. Under the price mechanism viewpoint, market participants naturally gravitate towards production that is most rewarding. The influx and departure of market participants, as prices change, balances the economic system. Hence, the price mechanism autonomously directs the economic system.

The price mechanism is the allocator of resources within the economic system, and allocates according to price and quantity. Therefore, all resource allocation within an economic system is dependent on the price mechanism. This means the system lacks "central control" and "over the whole range of human activity and human need, supply is adjusted to demand, and production to consumption, by a process that is automatic, elastic and responsive" (Coase, 1937, p. 387). Coase challenged his contemporaries by suggesting that although those forces exist,[5] a firm can supersede the price mechanism.

Coase theorizes that at the firm level, the firm has the ability to control resources, and can supersede the price mechanism. This is accomplished by controlling the allocation of resources through creation of an internal market. Firms are able to do this through vertical/horizontal integration or developing through new operations[6] that create

[5] Coase acknowledged the naturally occurring economic forces like the price mechanism, but sought to explain how these forces could be superseded by other economic forces.
[6] Business operations are the tangible and intangible features of a firm.

tools for the firm to control its resources. Broadening operations makes the firm less reliant on the market and expands its production capability.

The entrepreneur is key to the creation of a firm. It is through innovation by the entrepreneur that a firm is created. The firm develops from innovations by the entrepreneur or from the entrepreneur's ability to apply the innovations of others to fill a need within the market (Schumpeter, 1993). Innovation is a result of the information that the entrepreneur has developed and has discovered a way to market the idea.

As a firm expands and integrates production via employees, equipment, businesses or anything that can advance the expansionary goal of the firm, it is also taking on additional resources. These additional resources expand the firm's private economy, which is controlled by the entrepreneur. Because the entrepreneur controls the economy, the entrepreneur is free to direct resources to accomplish the desired production goals. Production goals are the nature of the business and what it is producing to eventually sell on the market.

Entrepreneurs may often have multiple roles within the firm such as organizing resources, providing leadership, and fixing operating issues (Schumpeter, 1993). The presence and interaction of the entrepreneur may change over time and the roles of the entrepreneur may be distributed to individuals within the firm. To preserve the terminology used by Coase, we will maintain the use of entrepreneur within this section, but it must be noted that innovation may not be the only role of the entrepreneur. An entrepreneur leads, organizes, and sets the strategic course for the firm. Oftentimes these roles are assigned to the President, Board of Directors, or whatever hierarchical body that directs and makes decisions for the firm. The association of the entrepreneur with the

firm may change over time. The entrepreneur may assume the role of owner, manager, stockholding president, or sell the firm to another entity and cease connection. Sometimes, the entrepreneur remains with the firm and may hold one of those hierarchal positions previously mentioned.

The entrepreneur is responsible for determining the most cost-effective method of production. Throughout the production process, the entrepreneur faces the decision to either make-or-buy. Internalizing production offers the benefit of reduced costs and increased capabilities for the firm. The alternative is purchasing from a vendor on the market that is already producing the component. If the entrepreneur elects to make a good,[7] then the resources within the firm are directed to incorporate the process into the overall structure of the firm.

Controlling resources gives the firm the ability to exchange goods within the firm without the influence of the external price mechanism. The firm becomes subject to the price mechanism when selling products on the market and buying goods from a vendor. Hence, Coase emphasizes that there must be the distinction between "allocation of resources of a firm and allocation of resources within an economic system" (Coase, 1937, p. 389). The open market may be efficient at allocating the overall need of society, but there are costs associated with the market that increases the cost of the good or service to the firm.

"The most obvious cost of 'organizing' production through the price mechanism is that of discovering what the relevant prices are" (Coase, 1937, p. 390). Knowing the

[7] If the entrepreneur elects to make the good, then the process is incorporated into the production process and operation of the firm. Not all internalization activity is production based and may be ancillary to the firm.

cost of production is key to a make-or-buy decision for the firm, but Coase explains this is not the only advantage of internalizing operations. We will return to this idea of discovering relevant prices in the following chapter.

The costs associated with the open market are search, bargaining, enforcement, information, and taxation. These costs can be reduced through internalization into the organization of the firm. Organizing is the first advantage a firm can use to supersede the price mechanism. By creating an internal market, the entrepreneur overcomes the excess costs of using the price mechanism.

The first cost of using the price mechanism is the cost of information. Coase focuses on information as a cost of the market rather than the advantages that come from information, which will be discussed in later chapters of this thesis. Coase noticed information on the market is sold at a premium. For example, using a middleman[8] to advise and to help resolve production needs increases the costs for the firm. There are implicit and explicit costs to using the middleman. An explicit cost first is the premium paid in order to get the desired good or service. Other costs may be implicit, such as time spent in gather information.

Searching is the next cost to using the market. Searching is similar to information. The time the firm spends searching takes resources away from production and represents a cost. Coase explains a firm has higher costs associated with searching if it does not use long-term employment. Contracts require bargaining that can be costly. Many short-term contracts likely have higher bargaining costs along with more search

[8] Suppliers, attorneys, accountants, and subcontractors sell information as the primary means of business activity. These are real-world examples of selling information.

costs. Long-term contracts, on the other hand, are done at inception or infrequently.[9] Furthermore, long-term contracts offer the flexibility to allow for ambiguity. In other words, a long-term employment contract has the flexibility to direct employees to a more pressing matter if necessary, whereas a short-term contract may lack the flexibility and may require additional temporary employees or contracts.

Enforcement is also an implicit cost of the open market. Using vendors on the market has limited enforcement power. The firm cannot direct the vendor's resources or production activity to ensure the order is fulfilled properly. If a firm is reliant on another vendor outside of the firm, it is a potential liability to the firm. Even with a contract, the firm may be left with incomplete delivery. The firm may have retaliatory power, but only to the extent the firm is made whole. If production is impacted either from a late or incorrect order, it may impair client relations for the firm, which has consequences that may be difficult to rectify. Ultimately, there is limited enforcement power when dealing with the open market. Alternatively, the firm has greater enforcement power over production it controls. Internalization offers assurance that the component in the production process is being produced timely and correctly.

Taxation is another cost of the market. As the firm begins to control more resources, it is able to exchange these resources between areas of the firm to accomplish the end product. This internal market is not subject to the same regulatory restrictions as goods or services exchanged on the open market. Sales tax is not required on intrafirm trade and the production process between production areas passes tax-free. The firm will also be required to pay income tax when it sells to the external market. This gives firms

[9] Long-term contracts may have the periodic bargaining issue where employees demand higher wages or other demands to maintain employment.

another unique power that helps reduce costs below the price mechanism. Apart from lower prices, the internal market is not subject to the price wars that can occur on the open market. Price rationing or bidding increase the cost to purchase goods or services on the open market. Transactions within a firm are coordinated by means of transfer pricing. Transfer pricing is often predetermined[10] or set by upper management. Upper management can control prices between areas of production. Transfer prices can be helpful to assign proper costs and profits to each area of production. Constricting the internal exchanges through predetermined prices allows divisions of the firm to work together toward a common goal rather than bid against each other to increase divisional profits.

Coase explains there are limits to a firm's ability to expand. Expansion reaches a limit when there are no cost reducing benefits.[11] The firm reaches a point it ceases expanding because the cost to produce equals the cost of purchasing on the market. For example, the overhead cost might increase faster and disproportionally to the savings of producing internally.

The other likely scenario is that the firm becomes too large for the entrepreneur to control. Coase explains the firm reaches a point where "the entrepreneur fails to place the factors of production in the uses where their value is greatest, that is, fails to make the best use of the factors of production" (Coase, 1937, p. 394). Wasting resources results in an increase cost to the firm that limits the ability for the firm to expand. The entrepreneur

[10] Management may decide to set the transfer prices to cost, market price, or some other specifications such as for tax purposes. Tax purposes will be discussed later in this thesis at greater length.

[11] Coase argues that as firms expand it will have diminishing returns. A point will be reached that internal production has no cost reducing benefit compared to purchasing on the market.

may be unable to overcome poor allocation. Hence, Coase theorizes that the firm ceases expansion at the point where the cost of organizing internally is equal to the cost of purchasing on the open market.

2.1.3 Production, Information Costs and Economic Organization (1972)

In "Production, Information Costs and Economic Organization," Armen Alchian and Harold Demsetz (1972) focus on defining the firm. They focus on team production and contracts being the facilitators of firms. In an economic system, a firm only controls a small portion of all resources within the economic system. Resources are distributed through tacit or formally created contracts. These contracts are built on the agreement that the "price [is] acceptable for both parties" (Alchian & Dementz, 1972, p. 777). Some contracts are between two parties[12] without any relation.[13] The two parties have an incentive to see the contract completed. One party produces and the other party promises payment for the requested production activity. It is possible that one party to hold both ends of a contract. This is more common where a firm is requesting production from workers and also paying the workers for production. This can create problems for the firm because it is holding both ends of the contract.

The problem centers on the idea of metering. For example, suppose an owner of a firm requests one of the employees to complete a given task. The employee is paid throughout the entire task and is paid whether the task is completed timely or slowly. The employee is faced with the tradeoff between work and pleasure. It is in the interest of the employee to shirk - avoid work. Therefore, the owner of the firm must implement

[12] Contracts can be created between individuals, businesses, customers, etc.
[13] In order for a contract to be nonrelated it must be at "arms-length."

a means to enforce the employee to work on the production process. Obviously, the employee in this case is subject to termination if the owner feels that the production level is inadequate. If there are more than two employees, the owner may have a more difficult time distinguishing which employee is shirking. One obvious problem is the lack of information.

Alchian and Demsetz explain that monitoring becomes more difficult when team production is involved because of the difficultly assigning the problem to specific members of a team. This is because "working as a team, individual inputs do not yield identifiable, separate products" (Alchian & Dementz, 1972, p. 779). Rewarding the team based on production entices the team to "replace excessively shirking members" (Alchian & Dementz, 1972, p. 781). This is interesting because even though the managers lack information, rewarding the team based on production diminishes the likelihood that a shirking worker could get away with shirking. Although this approach may create disharmony between team members, it demonstrates clearly how changing arrangement can make information available.

Alternatively, a specialist[14] can be used to oversee team production. A specialist offers more than just monitoring production. Alchian and Demsetz recommend, "the specialist… receives... residual rewards [based on production of] members of the team" (Alchian & Dementz, 1972, p. 782). Paying the specialist according to production encourages them to organize individuals to maximize production potential. Furthermore, a specialist is in a unilateral situation with team members, which increases intervention power with limited recourse. This relationship is contractual between the specialist and

[14] An example of a specialist is a manager commissioned to oversee production.

the team members. The contractual relationship is what binds the employees within a firm and the mechanism that enables them to work.

Firms may be viewed as collection of contracts. These contracts work together in team production to accomplish production goals. Alchian and Demsetz redefine the firm using six characteristics. The first is the firm must have coordinated production goals. The second is the firm must contract workers that are able to aid in the production goal. The third is there must be one individual or group that is central to all production contracts. Fourth, a central individual or group must have the power to renegotiate contracts independently. Fifth, that individual must uphold the contacts. Lastly, the firm is a collection of contracts working toward a common goal through team production. It is when a firm has these six characteristics that the firm is competitive in the market.

2.1.4 A Resource-Based View of the Firm (1984)

Birger Wernerfelt's (1984) "A Resource-Based View of the Firm" builds off of some of the ideas presented by Edith Penrose about resources.[15] Wernerfelt argues the definition of the firm should be expanded beyond what Armen Alchian and Harold Demsetz purposed and should include all resources of the firm. Wernerfelt feels that all resources add either "strength[s] or weakness[es] to a given firm" (Wernerfelt, 1984, p. 172). It should be noted that the resources encompass all the tangible and intangible assets, including things such a customer loyalty or any aspect of information. The ability to control resources or substitute competitor's resources allows for growth. Hence, "the

[15] Penrose argued that human assets could grow over time. Similar to the learning curve of production, a person undergoes a learning process that increases with management assistance and time spent learning specific skills (Penrose, 1995).

optimal growth of the firm involves a balance between exploitation of existing resources and development of new ones" (Wernerfelt, 1984, p. 178).

Resources, therefore, are more important to the growth of the firm than the products produced by the firm. Hence, the firm should put emphasis on protecting resources. Protecting resources for the firm is very difficult because not all resources are easily identifiable. As mentioned earlier, resources are completely encompassing[16] for the firm, which makes retention more difficult. The focus of the firm in protecting resources forms the firm boundary.

2.1.5 Theory of the Firm as Governance Structure: From Choice to Contract (2002)

In "Theory of the Firm as Governance Structure: From Choice to Contract," Oliver Williamson (2002) argues that firms seek to economize on transaction costs, just as Coase theorized, but focuses on governance. In the previous article "Production, Information Costs and Economic Organization," the parallel was made that changing the incentive structure can change information. This article takes a similar approach, but from a structural perspective. For the purpose of this thesis, structure can inhibit or enhance the flow of information.

Williamson's theory is that through governance, a firm can reduce transaction costs. Governance includes contracts held and created by the firm, but must also include private ordering and governance structure.

Private ordering helps "reduce the cost of regulation" (Schwarcz, 2002, p. 321).

[16] Resources in this theory are everything on the balance sheet, employees, customer loyalty, etc. Anything that the firm contacts would has some form of resource.

This is accomplished by allocating resources through market incentives created by the firm. Traditionally, governance is viewed as how the firm is directed via the policies, operating procedures, or plans. Williamson explains, "the attributes of the governance structure include incentive intensity, administrative control and contract law regime" (Williamson, 2002, p. 180). Hence, within a firm, incentives and disputes are controlled. This control extends to contracts directing resources toward specified outputs. This idea can be applied to information. Information that is irrelevant to the duties of an employee should be removed. For example, suppose a firm had a mechanic and an accountant. Their informational needs would be very different even though there may be some similar informational overlap. This idea of designing the firm to control information is addressed further in the following chapters.

There are two major advantages a firm gains through contracts and results in a competitive advantage. The first advantage is asset specificity. The higher the asset specificity, the narrower the focus is on a task of production. It could be anything from a special tool to training an employee for a task that is unique to that part of production. With respect to this thesis, the firm is able to provide information to an individual that may not have the required skillset or narrows the information to only include the pertinent information, both of which are cost-effective in getting the desired outcome.

Asset specificity allows the firm to increase complexity without increasing the need of the market. The transaction costs that would normally be incurred with complexity are internalized and the cost of the transaction is below the cost of the market. As asset specificity increases, competitors of the firm will have greater difficulty replicating the process either from a procedural or cost standpoint until they are able to

match or imitate the process in some form. This is critical if a firm wishes to maintain an informational competitive advantage.

The other advantage is that a firm is able to overcome hazards that would have no easy solution on the market. A firm uses contracts to overcome hazards more easily than without a contract on the market. For those reasons, asset specificity and hazards are more likely to produce firms. In contrast, where there is low asset specificity, the individuals will have greater advantage because there are lower barriers to entry and generally carry less overhead.

2.2 Production Efficiency

Comparing efficiencies is information that the firm can use for short-term or long-term strategy. It is likely in the real world that a firm could be faced with two or more ways to carry out any given task or process. Production efficiency in the context of this thesis is concerned with how well the production process in general is aligned with the goals and direction of the firm.

The reason for a comparative efficiency focus is that it can be used statically and also dynamically for comparative purposes. A static comparison can be accomplished by comparing the efficiency of two processes that have similar outcomes. A dynamic comparison can be used to build relations with other processes of production or even measure the process against itself over time. Both are important because in decision-making there can be unique advantages depending on the desired outcome.

Production processes vary and a process deemed more efficient in total output may be less efficient in other areas. The entrepreneur or whoever is the decision-maker

for the firm can use comparative efficiencies to determine the desired path of the firm. An example is comparing how two different production processes create a different table. The first may use hand tools and the other heavy machinery; the first produces the table with an emphasis on craftsmanship or human labor and the latter focuses on machine labor. Both will have different efficiencies in how they produce. Even though they have different efficiencies, they excel in some or many aspects of producing the similar goods.

The decision-maker can compare these efficiencies and pursue a path aligned with the goals of the firm. Hence, if the firm desires to produce unique tables, it is unlikely that the firm would choose heavy machinery. Even though heavy machinery likely has a much higher capability of producing tables quickly, it does not fit within the goals of the firm. The main point to be made is that efficiencies can be compared in various ways as long as they are similar in purpose.

Hence, a firm may consider higher efficiency to be less waste in the production process because the goals of the firm are to lower overall costs or increased profitability. Another option is the firm may wish to become more competitive by discounting the selling price to gain market share while maintaining profitability. Whatever the reason, production efficiency is critical to decision-making.

2.2.1 The Learning Curve and Competition (1973)

The article "The Learning Curve and Competition" by A. Michael Spence (1973) expands on the idea that a firm can increase efficiency through a learning process that

specializes production for the firm. Specialization and production efficiency[17] were discussed earlier in the thesis. Continuing on with those ideas of the learning curve, added context is given to the decision-making of specialization. Spence explains, "the short-run output decision is a type of investment decision" (Spence, 1973, p. 49). To elaborate, an entrepreneur is faced with a decision to increase production efficiency; this decision is an investment because the entrepreneur is basing the decision on profitable expectations.

Expectations are similar to sunk costs in that it takes time to recover or realize the investment of specializing. The long-term benefits and expectations are that the learning curve will help gain production efficiencies or create advantages over market rivals. Spence argues that the cost of the learning curve declines over time. Interestingly, not all learning curves are equal and the shape and duration varies. A way to reduce the learning curve is to hire individuals familiar with the specific learning curve.[18] Conversely, a firm that has passed through the learning curve may attempt to guard information regarding the skills and knowledge necessary in an attempt to maintain the advantage over others not familiar with the learning curve.

The last major concept of the learning curve is how difficult is it to pass through. How long it takes to pass through determines if there is an advantage of knowing the learning curve. If the learning curve is "either very slow or very fast, competition prevails because the entry barriers are low" (Spence, 1973, p. 68). If the learning curve is fast, then entrants can easily enter the market and there is no real advantage to the

[17] Specialization and production efficiency concepts can be found in an earlier section, "Wealth of Nations" by Adam Smith (1776).
[18] These individuals may have technical training that is related to the production process that allows the firm to increase the speed of the learning curve.

learning curve.

If the learning curve is slow, then a firm passing through the learning curve will have higher costs for a long period, which may make it less competitive. This is because competitors may have lower productions cost by avoiding the costs of specializing. Another possibility is the specializing firm is a late adopter and the competition has already passed through the learning curve and is capitalizing on the benefits. If a firm has specialized and none of the competitors have passed through the learning curve, the firm has a monopoly advantage and can maintain dominance until another firm passes through the curve or a substitute is found.

2.3 Transaction Cost

Transaction cost theory is important to this thesis because it provides a source of information that firms can use as a basis for decisions. Oftentimes when comparing production efficiencies, transaction costs of a specific part of the production process can be isolated and compared with other possible processes as alternatives. Basically, transaction cost helps the firm identify the cost of transferring goods in areas of production.

A transaction cost is the cost of transferring goods or services "across a technologically separable interface" (Williamson, 1981, p. 552). Within a firm, it is where the transfer of goods or services begins and ends in the production process. There is a cost to the transfer that is either explicit or implicit throughout the transfer process. Additionally, this cost is necessary for the transfer to occur. For example, purchasing an apple from the supermarket has both implicit and explicit costs. An explicit cost is the

price of the apple and an implicit cost is the time required to go to the supermarket to purchase the apple.

The first area of transaction cost is the overall structure of the firm. It is the interaction between various operating areas of the firm and how they interact together. This would include the cost of using the market.

The second area of transaction cost is operating activity dictating transaction cost. Whether the price mechanism or management direction, transaction cost has implied control over the path of production. This area is concerned with the "efficient boundary."[19] Transaction costs in this area are mainly concerned with the make-or-buy decisions a firm faces.

The third area of transaction cost area is how human assets are organized. In this third category, transaction costs can "match internal governance structures with attributes of work groups in a discriminating way" (Williamson, 1981, p. 549). In other words, transaction costs are incurred by enforcing and imposing the will of the firm.

2.3.1 The Economics of Organization: The Transaction Cost Approach (1981)

As explained in the introduction to this section, there are three main areas of study in transaction cost theory. Oliver Williamson's article, "The Economics of Organization: The Transaction Cost Approach" (1981), is mainly concerned with the efficient boundary of a firm and how transaction costs manage human assets. One common element in both of these areas is that they have an implicit governing power.

[19] The term efficient boundary was popularized by Ouchi (1980) and is where a firm is able to realize increased or diminished production. Coase uses a similar term "firm boundary" and they are in some ways related.

For Williamson, transaction costs form an efficient boundary of operation for the firm. The efficient boundary is the current resources and production, the resources and production avoided, and the make-or-buy decisions of the firm. Depending on whether the firm produces or purchases a good or service determines the firm boundary. The firm boundary is where internal production ceases and the market[20] fulfills the remaining production.

The firm boundary is the static position of how the firm is currently functioning. Internal production has added benefits that may compel a firm with capability to capture the opportunity that internal production offers. Williamson explains there are three major advantages to internal production. The first advantage is having the ability to optimize or specify production needs in detail. The second is having full control over disputes that arise in production. Third, the relevant information regarding a dispute is obtainable.

As a firm grows, interactions between divisions require additional management to handle the increasing number of transactions. Even though there are advantages of internalizing the market, the firm will reach a point where it is too large to manage properly. This is because transactions become so numerous that management is unable to handle the volume. This is important because the firm's ability to expand is directly linked to the information it can handle.

Mismanagement and mistakes may lead to diminishing returns. Firms that reach this point will have diminishing returns from the increased transactions. The firm at this point will be producing internally at the same price to purchase on the market. If the firm produces at a higher cost than the market price, the competitiveness of the firm is

[20] In this case, it is referring to an external market. The internal market is the form of the market boundary and anything outside the firm is external from the firm.

reduced. The reduction to the firm's competitiveness limits further growth. In other words, the size of the firm is limited by the diminishing returns due to an increased size of management (Sraffa, 1926).

The other major governing power of transaction costs is the ability to manage human assets. This is a power that is controllable by the firm, whereas the efficient boundary is unmanageable. At the firm level, transactions have three attributes; "frequency, uncertainty and asset specificity."[21] The more asset-specific a firm becomes, the narrower the focus of production is. For example, if a firm purchases a machine requiring special training to operate, that process increases asset specificity. Higher asset specificity by the firm requires higher specialization of human asset. Higher asset specificity increases performance of production, but may also come at a higher cost. Moreover, asset specificity is not limited to machinery; asset specificity may be exclusive to human capital within a firm. Higher asset specificity can also be viewed as increasing information where the firm is trying to specialize.

The more specialized an employee becomes, the less likely a suitable substitute can be used in production. Determining how specialized an employee is for the firm can be done by assessing how firm-specific the employee is and how easily the employee can be metered (Williamson, 1981). The more firm-specific production is by the employee, the more important the role of the employee is for the firm. Additionally, the inability to meter increases with specificity.

Williamson explains the degree to which the combination of these measurements determines the firm's ability to govern the human asset. Williamson argues that given

[21] These ideas were previously expressed in Williamson's "Theory of the Firm" (1937). Although this paper was written prior to his firm theory, the ideas are maintained.

the nature of the transaction the "governance structures are tailored to the specific needs of the transaction" (Williamson, 1981, p. 568). Tailoring the governance structure is another way a firm limits its boundary.

2.4 Transfer Pricing

A big component of the theory in this thesis is that firms try to guard information. It will be argued that transfer pricing is an example of how a firm can guard information. More will be discussed on this concept in the following chapters, but it is necessary to cover how transfer pricing creates autonomy and how information is guarded.

Transfer pricing is the price at which a good or service is sold from one division to another under common ownership. Goods exchanged between divisions are referred to as intermediate goods. There are three ways to set the transfer prices of the intermediate goods between divisions: market-based price, cost-based price, and negotiated transfer price. One of the strategies of transfer pricing is the ability to shift profit between divisions.

Strategic application of transfer pricing can be used to increase profits for a division within a firm. This strategy involves intervention by upper management to assign selling prices between divisions rather than allowing each division to determine prices. The reason for this is that individual divisions may price for maximize profit at the division level rather than what would maximize profits for the firm. For example, one division may sell to another division at a discounted rate with the purpose to shift profit to that division. The purchasing division can use the purchased goods[22] to bring

[22] The buying and selling is not limited to physical goods and can extend to services or any exchange between divisions.

about a higher profit margin in its area of production. Shifting profits can be useful to lower tax costs for the firm. If all the divisions in the sale of goods are within a single tax district, a transfer to shift profits has no higher realization of profit. However, if there is a difference in tax rates between divisions, then the firm can have a higher profit margin if it shifts the profit to the division in the lower tax district.

Transfer pricing is often studied for this ability to shift profits from higher tax districts to lower tax districts. Although that is a very important concept of transfer pricing, it will not be fully discussed in this thesis. The purpose of transfer pricing within this thesis is to expand on the idea of the advantages of a controlled internal market by upper management. Transfer pricing has the unique characteristic of allowing passive independence. Each area of the firm may operate autonomously without the need to consult. Furthermore, transfer pricing restricts divisions from cannibalizing other divisions and limits disputes within the firm.

Cannibalization could possibly occur when there is no set transfer price. In a firm that uses profitability incentives, the divisions may seek to profit maximize by increasing the transfer price for the division buying the goods. Unrestricted increases of transfer prices in an incentive based firm could cause the firm's production to breakdown. Resolving this issue will likely require upper management intervention to set transfer prices. Transfers pricing helps limit pricing disputes between divisions and are directed to upper management and not other divisions. Additionally, transfer pricing helps separate divisions from excessive and unnecessary interaction such as negotiation.

2.4.1 On the Economics of Transfer Pricing (1956)

In "On the Economics of Transfer Pricing," Jack Hirshleifer (1956) addresses how transfer pricing can be used to achieve higher profits through eliminating competition between profit centers. Hirshleifer explains that as firms[23] expand, they create profit centers. These profit centers within the firm work autonomously and trade with other profit centers or divisions through an internal market. As mentioned at the beginning of this section, there are various ways to assign transfer prices. Hirshleifer argues that the transfer pricing should be set to "maximize the profit of the firm as a whole" (Hirshleifer, 1956, p. 172).

The problem is that profit centers are designed to work independently and are judged by net profitability. Competition to capture profit can increase between divisions where there is only a final market.[24] When only a final market exists and transfer prices are set by profit centers, profit centers may feel pressure or have incentive to increases profits by increasing its transfer price. Although some may not consider asymmetric informational problems in firms, this thesis argues they exist and this is an example of such an occurrence. The way a firm can overcome this problem is either better communication in firm, a new incentive structure, or as this thesis argues, by management control. The advantages of management control are that information centralizes on management and there is less risk of information being leaked. This is

[23] Hirshleifer uses corporation, but almost any other business entity applies.
[24] Sometimes a firm has multiple steps in the production process. At any given step of production, there may be a market that will buy the goods produced by a division at the intermediate stage of production. Goods at this stage may not necessarily be the main production goal of the firm, but are goods sold in conjunction with final goods. Hence, a division in production that has an intermediate market can sell goods to both other divisions and also to the market.

discussed at greater length in later chapters, but for now, we will continue the Hirshleifer argument.

Hirshleifer argues firms can still profit maximization even where there are no intermediate markets. He argues that all of the profit centers except for the final division must be set to the "sum of the divisional marginal cost equal to the marginal revenue for the final market" (Hirshleifer, 1956, p. 175).

Alternatively, if there are perfectly competitive intermediate markets for the intermediate profit centers, then transfer prices should be "market price" (Hirshleifer, 1956). If intermediate profit centers have a market to dispense of intermediate goods, then profit centers can produce according to the firm production schedule in addition to the intermediate market demand. The existence of intermediate markets in the production process determines what transfer pricing method should be used by the firm.

2.5 Asymmetric Information

Asymmetric information is approached from two viewpoints in this thesis. The first maintains that asymmetric information can be overcome through screening, signaling, or by developing information. The other viewpoint is firms wish to control what information is dispersed. In the section on transfer pricing, it was suggested that transfer pricing is a way to guard information by making units of the firm autonomous. This is important because in a transfer pricing setting, where there is high autonomy, it is easier for a firm to guard production information. This is because only relevant information is distributed to production areas and there is less access to complete information.

Protecting information is a competitive advantage for the firm and if lost, may result in a portion of the firm's competitive advantage being lost. More on this idea will be discussed shortly, but it is important to introduce the concept that protecting information is a major goal of firms. The following articles in this section address how an individual can overcome asymmetric information even though the individual may lack the necessary information concerning the situation.

Asymmetric information occurs when there is an imbalance of information, for example, a situation where two parties in an exchange have significantly different levels of critical information about the exchange. The party with the higher levels of information has more leverage in the negotiation process. This may lead to the uniformed party paying a higher price or being taken advantage of during the transaction. The lack of critical information between the parties may lead to future problems or even put one party out of business. Critical information would be anything that would make one party act differently or wish a different outcome. The presence of asymmetric information creates increased uncertainty for the uninformed party. The following journal articles are some of the key ideas to understanding how individuals or firm can overcome asymmetric information.

2.5.1 The Market for "Lemons": Quality Uncertainty and the Market Mechanism (1970)

In the "The Market for "Lemons": Quality Uncertainty and the Market mechanism," George Akerlof (1970) explains that asymmetric information can create problems in exchanges. Asymmetric information problems arise when there is uneven distribution of information between two parties concerning the transaction. This creates

an advantage for the party with greatest information and a disadvantage for the party with least information. Akerlof applies the idea of this imbalance of information to a used car market. In the example, the used car market has both good and bad cars. The dealers of the cars know more about the quality of their car than the potential buyer. Based on the quality of the car, the dealer is only willing to sell the car for its value or higher.

The buyer, on the other hand, knows there are good and bad cars in the used car market. The buyer has difficulty determining the quality of individual used cars in the market. To hedge the risk of not knowing the quality of each car, the buyer assumes all cars are average and will only pay an average rate for a used car. In this scenario, the dealers of the good cars are unwilling to let their cars go for sub-worth rate and the dealers with the bad cars are more than willing to sell their inferior cars because the average the buyer is willing to pay is more than the value of the car.

Akerlof explains that the "bad cars drive out the good because they sell at the same price as good" (Akerlof, 1970, p. 490). Furthermore, over the course of time through various iterations, the really bad cars drive out the "not-so-bad" within the used car market. In the long run, many iterations of decreasing quality destroy the used car market. Akerlof calls this example of the used cars the lemon principle.

Akerlof argues that the lemon principle may be applied to employment. The predisposition of the employer toward employee candidates in the hiring process makes the candidate more or less hirable depending on their individual characteristics. This is mostly due to the employer being uncertain of the actual ability of the candidate. In light of this problem, unbiased institutions offer credibility to the employers. These institutions, such as higher education, offer training, education, and certifications that

help develop skillsets. Once the skillset has been developed and learned by the individual, these institutions endorse the individual on their training. Hence, these third parties may be useful in assuring the employer of quality and creditability.

Because there is asymmetrical information, firms can increase their chance of success by building creditability and assuring quality. This can be accomplished through building brand recognition or offering guarantees. These business practices build trust between the seller and buyer. In turn, the market is more confident it will not be a market of "lemons." Equally, where asymmetric information is extreme, a lack of trust can destroy the market and consumer confidence.

2.5.2 Job Market Signaling (1973)

Michael Spence (1937) builds off some of the same ideas presented by Akerlof in "Job Market Signaling," particularly the idea of uncertainty. Spence uses the example of a firm hiring an individual. At the interview stage, the firm can only speculate on the capabilities of the individual. Even after hiring the individual, if the position is complicated, there may be a period of time the capability of the individual is unclear as they progress through the learning curve. This prolongs the uncertainty of hiring the individual for the firm. Based on this scenario, when a firm hires an employee for a skilled position, the firm is making an investment in the individual in hopes that the employee's skillset meets the demands of the job. Hence, the employee is an investment for the firm.

Spence explains the firm recognizes the uncertainty of the applicant's skillset and will try to overcome this problem through increased information. The firm will collect

information[25] on the job candidate to determine how well the individual is suited for the job. Some of the data collected by the firm is "unalterable," such as race, and other data is "alterable," such as education. The alterable data points are signals to the hiring employer that the individual has or does not have proper qualifications for the job. Throughout the many iterations of hiring, the firm begins to build beliefs on what signals are most useful for the firm. The firm becomes more specific about the qualities needed for the job and "the employer's beliefs may drive certain groups from the market and into another labor market" (Spence, 1973, p. 366).

Overcoming asymmetric information requires either signaling or collecting information to overcome uncertainty. For instance, in the example of the hiring process, the employer is acting as a buyer. The employer is uninformed on the true ability of the applicant. The applicant is trying to convince the employer that he or she has the necessary qualifications for the job, either by developing a strong skillset or experience. The applicant demonstrates credibility to the employer through obtaining strong skillsets or experience, which help to overcome the employer's lack of assurance.

The nature of this problem is rooted in the presence of uncertainty from asymmetric information. The way to overcome uncertainty is to gain information. Joseph Stiglitz explained that a firm can "screen,"[26] which is somewhat described above when the employer is specifically asking for certain qualifications. Screening is different from signaling because the employee is actively determining capability rather than rely on a signal from a third party.

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[25] This information may include: education, race, previous employer, experience, criminal record, and any other data that may be useful.

[26] Screening helps employers identify qualified candidates more easily during a hiring process (Stiglitz, 1975).

2.5.3 Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure (1976)

Michael Jensen and William Meckling's article "Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure," (1976) may feel misplaced, but I only intend to elaborate on a small portion of this article that deals with asymmetric information and transaction cost. The principal-agent problem is where one party is trying to get another party to fulfill a task.

The principal-agent problem begins with the contractual obligation of one party "to perform some service on their behalf which involves delegating some decision-making authority to the agent" (Jensen & Meckling, 1976, p. 5). Jensen and Meckling argue that if "both parties [in] the relationship are utility maximizers, there is good reason to believe that the agent will not always act in the best interests of the principal" (Jensen & Meckling, 1976, p. 5).

The principal can choose to guard against the adverse interests of the agents through bonding[27] and monitoring.[28] These help protect the principal, but result in an explicit and/or implicit cost to the principal. Also, Jensen and Meckling explain these costs reduce the overall welfare of the principal. The loss of welfare for the principal is referred to as the residual loss because the allocation and distribution of the principal's resources are impacted. The sum of these costs incurred is the cost of the agency relationship.

In the agency relationship, the principal must pay for monitoring in order to

[27] Bonding restricts the agent through a non-compete disclosure. This reduces the potential damage a knowledgeable agent could have in competing against the principal employer.

[28] Some of the monitoring tools used are security system, auditors, controller, etc. The purpose of these tools is to protect the principal's interest and property.

assure the agent is carrying out the principal's request. Monitoring costs are based on the idea that added information will reduce the shirking of the agent. This remains an asymmetric problem, where the agent will make the most of the transaction and choose pleasure over work. In order for the principal to get the desired results from the exchange, monitoring is needed to enforce the agent to work. Monitoring increases information, but may also increase costs.

CHAPTER 3

INFORMATION OVER TRANSACTION COST

Of all the theories of the firm we discussed in the literature review, only one that was reviewed sought to explain why firms exist. The purpose of this thesis is to explain the role of information in the theory of the firm and offer a new perspective on why firms exist. In Coase's "Nature of the Firm" (1937), he explained why firms exist and what limits firm expansion. This thesis challenges Coase's idea that firms exist to lower transaction costs. Transaction costs are not the best way to describe firm development from two points. The first is that not all business decisions or production paths are focused on lowering transaction costs. The second is that when firms reduce transaction costs, it is because of information.

Reducing transaction costs are often dependent on the firm acquiring enough information to recognize the opportunity to reduce the cost. Firms are limited to what information they can develop, and as Coase pointed out, firms reduce transaction costs, but only if it is beneficial for the firm. This is because the firm often considers the implicit and explicit costs that may be incurred in order to reduce transaction costs.

These two points are best explained in the following example. Suppose a firm is considering building a factory in a foreign country in an attempt to reduce transaction

costs. The explicit transaction cost savings may be great, but the potential implicit costs and risks may prevent the firm from choosing that production path. Ultimately, whether the firm decides to build the factory comes down to the sum of information collected by the firm. Based on the information, the firm is certain or uncertain about the potential outcome of building the factory.

Certainty and uncertainty are basic ways to describe the confidence of an individual or group with the information obtained. Information that is difficult or impossible for the firm to develop or obtain has high uncertainty. Coase's transaction costs all have a naturally higher level of uncertainty because they are market transactions. Market transactions are costly because of inherent uncertainty. Reducing the uncertainty through internalization helps to reduce the uncertainty, and as a result, lower transaction cost. This idea is demonstrated in the remainder of the chapter.

3.1 Searching

Coase argued search costs would be higher if the firm did not use long-term contracts (Coase, 1937). Searching requires effort and resources that takes employees away from their regular duties. Searching is expensive because of uncertainty. Uncertainty causes costs to increase because it is unclear what the firm should do. It does this by prolonging the search process until an adequate level of certainty to make a decision is achieved. We learned that signaling helps overcome uncertainty, but signaling only serves as an indicator of ability. There are many other factors that are more difficult to signal, such as personality.

Let us examine a situation where there is complete certainty. Suppose an

employee is in charge of the hiring process for a firm. If the manager charged with hiring was perfectly informed on all the applicants' skillsets and how they could be integrated into the firm, then the decision would likely be instantaneous and the hirer could match the right candidate to the job. This is because the hirer has certainty of information and knows who would be the best person for the job.

The search process would be quick with certainty. It would require little time for completion and would result in a negligible cost. We can assume that someone perfectly informed would make an instant decision and conversely, a completely uninformed person would require a lengthy span of time to make a correct decision. The correlation would likely resemble some linear relationship, where we would expect information expediting the process.

A more realistic example that demonstrates how firm certainty is key to driving down costs is when a group of individuals work together for a long time and know each other's capabilities. If this group is given a task to complete, it is likely the group could easily assign duties because the group as a whole is well aware of each other's capabilities. Over the course of time, as a team becomes more familiar with other team members' skillset, uncertainty is reduced and search costs decrease. The group still incurs search costs for the firm, but the cost is reduced because of increased certainty.

These examples show that as certainty increases, search costs tend to decrease. Internalization is a key component to increasing certainty for the firm and reducing costs. Certainty is gained through experience with the firm and team members, and in many ways, this relationship extends beyond the search process. A more suitable way to explain this is that it is the learning curve of operations. As individuals develop skills

associated with their job, they increase and contribute to the overall certainty of the firm. Furthermore, there is a learning curve to teamwork and a logistical learning curve to all the components of the firm. Certainty adds vital operational intelligence and can result in lower costs.

Another aspect of why a firm tries to overcome uncertainty is to gain the advantages of efficiency. Firms that specialize are more knowledgeable of how to optimize performance in its specialty and able to manage cost more effectively.

Uncertainty is a major factor that drives up search costs. This may explain why a firm makes large investments in training new employees or emphasizes the importance of continuing education to long-time employees. For a firm to be successful, it must train or help develop employee skillsets for the unique duties of the firm.

Employees are an actual part of the firm and if the firm recognizes this, it has the power to cultivate and craft the employee's skills to maximize their utility for the firm. Alternatively, the firm would struggle at training applicants for a job they may not get. Internalization is naturally the best option for the firm because it offers the firm the ability to precisely train employees for the skills necessary to complete the tasks required by the firm. This precision decreases uncertainty and increases stability.

Firms invest in data with the purpose to gain information to overcome uncertainty. These investments, such as developing a client list, can either be bought or created by the firm through effort. This becomes part of the operational intelligence, which will be discussed in the next chapter, but is within the overall knowledge of the firm.

As we have seen, searching can have high uncertainty. Uncertainty drives a firm

to internalize where possible. Uncertainty increases the time required for decision-making. By internalizing, the firm develops a learning curve that helps the firm create essential competitive information and also reduces search costs. This serves as a competitive advantage for the firm in the marketplace because the firm is more knowledgeable and has a larger margin for profit.

3.2 Bargaining

Bargaining costs are the next area Coase mentioned in his theory. Coase argued that firms are able to lower transaction costs through long-term contracts. Long-term contracts are more flexible and can lack specificity. Lacking specificity is a way for the firm to use uncertainty favorably.

First, let us return to the "used car" example by Akerlof to explain why uncertainty is bad in a free market exchange. Akerlof argued that in a market, if there were no way for the customers to determine quality of goods in the market, the market would be susceptible to failure. In this example, Akerlof warned that if information were asymmetrical, then the bad cars would crowd out the good cars. This is because the buyers are only willing to pay for an average-quality car to hedge the risk of paying a high price for a low-quality car. In the example, car dealers knew the value of their car and were only willing to sell their car for anything equal to or higher than the value of the car. Hence, if the going rate was below the value of the car, then the dealers refused to sell the good cars. In this example, only bad cars are sold because of the customer's uncertainty.

Alternatively, if customers have too much information, it can also be harmful to

an industry. Imagine if the buyers knew the value of every car. The buyers would be willing to only pay up to the intrinsic value of the cars and possibly some value for the dealer. It is likely this very informed consumer base would crowd out any profit for car dealers. This would be a huge problem and lead to the car supply collapsing. This is because each dealer has different operational costs and the prices would vary between all the dealers even when sold at cost. Even the dealer with the lowest cost would be unable to expand and take control of the market because it would likely increase costs resulting in diminished competitiveness. The only way complete transparency could work is if all the dealers had uniform expenses or one seller. Hence, it is in the interest of dealers to maintain a level uncertainty over actual costs because it could destroy profit.

Just as a car dealers wishes to maintain uncertainty of information with customers, it is also an advantage for the firm to maintain a level of uncertainty over what contribution is made by each employee. By issuing long-term contracts, the firm is able to employ an individual and direct the production of that individual. A lack of transparency becomes more favorable for a firm as the individual becomes more useful in production. This is because the individual lacks the ability to know their true value to the firm and would likely expect to be paid for usefulness. The lack of specificity in contracts is favorable for the firm because it helps maximize profits. This is because the firm has an individual that is more qualified and has developed a stronger skillset than a similar individual on the market. In other words, individuals within the firm are customized to their role. Hiring an individual outside the firm to do the same tasks as a long-time employee is initially a higher cost to the firm because it requires extra resources to develop the individual to the capabilities of a long-time employee. This is

not to say that all employees are underpaid, but it does suggest that the firm has an advantage when determining wage.

Uncertainty with employees is a major advantage for the firm because the individual is crafted and formed to meet specific needs of the firm. This is favorable for the firm because the employee can develop utility for the firm at a disproportionate rate of compensation.

3.3 Enforcement

Coase argued that a firm has limited control over the external market. This transaction cost provides control if internalized. However, enforcement is typically viewed as something that raises costs for the firm. In the principal-agent problem, it is implied that expansion increases enforcement costs for the firm. The idea is the firm must invest in methods that compel employees to work. For example, a manager of a paper company leaves town for the week. If the office has no enforcement measures and the employees know there are no enforcement measures, the employees will choose to play instead of work. The principal-agent problem is a major concern for firms because enforcing this relationship can increase costs and make the firm less cost efficient.

Enforcement ensures better control over production, that the project is done correctly and timely. Even with an added cost, the benefit to ensure that production is done properly may be worth the cost. This would explain why a firm would expand even if expansion increases enforcement costs. Even with rising enforcement costs, as firms grow, there is a natural increase of bargaining power over employees. This is because growth decreases the importance of any given employee. With expansion, if any given

individual leaves the firm, it has less impact to the overall success of the firm.

Returning to Coase's argument, he explains that enforcing a market transaction is more costly. The idea is that the contractor-agent problem becomes the principal-contractor problem. Enforcement of a market contract is much more difficult and monitoring is limited. Legal action and payment for completion of contract are the extent of the firm's monitoring ability. If a firm contracts with another firm on the market and the contract fails to be completed, some recoupment is possible, but it is likely that not all implicit damages can be recouped.

The extent to which a company can recoup damages is only to the extent that the law allows. Recoupment is generally[29] very easy for explicit losses. However, the implicit damage from a failed contract may not be easily quantified. For example, a seamstress is making a wedding dress for a bride's wedding day. The seamstress contracts with a fabric seller for a specially requested fabric by the bride. The seamstress specifies when the fabric is needed and the fabric seller is late. The seamstress has no way to complete the dress for the bride. The dress has no value to the bride if the dress is delivered the day after the wedding. The seamstress can sue the fabric supplier for the lost revenue (explicit). However, there are also implicit damages that may be very hard for the seamstress to prove such as the bride bringing bad publicity to the seamstress. Future customers for the seamstress may be lost because the bride's day is ruined. The results are real damages to the seamstress for being reliant on the market.

Given the risk of enforcing market contracts in the context of the previous example, it would be in the best interests of the firm to internalize. A firm can guard

[29] Typically, pain and suffering are difficult to prove and may be unlikely that a firm could recoup all damages.

against the inherent risk of a market contract through internalization. It is difficult in some situations for a firm to anticipate whether a contract will fail. If firms can anticipate failure, they will not make contracts. Hence, the firm is internalizing not because of the transaction cost, but rather to reduce uncertainty. Through internalization, a firm is able to gain certainty over the situation that would not be possible using the market.

3.4 Information

When Coase argued about the transaction cost of information, he focused on information sellers.[30] He argued that information sellers charge a premium for information that would be easily accessible through internalization. Internalization would provide the firm with relevant prices. If we look at information in this context under uncertainty, it could be argued that the firm has more than relevant prices to gain through internalization. Internalization adds many other areas of information aside from prices. Expansion grants the internalizing firm access to a complete array of information. This can range from information of a new group of customers to trade secrets that can help the buying firm. The benefits go far beyond eliminating the information sellers.

Information is vital to overcoming uncertainty. In the context of this thesis, information is any internal or external data of value to the firm. It is the learning curve of production, firm environment, teamwork, data, experience, and anything that increases information or familiarity for the firm. Information is also trade secrets, operating

[30] In "Nature of the Firm," Coase (1937) focused on information purchased from specialists. These specialists or middlemen can be eliminated through internalization. Information in this thesis focuses more on information as a resource rather than a cost to using the market.

procedures, proprietary information, and any other information that gives the firm a competitive edge in the market and helps reach profit maximization. It is the information that is distinct to the function of the firm and would jeopardize the market share of the firm if lost to a competitor. Information helps the overall operational intelligence of the firm, which helps to reduce uncertainty. Information also can serve as a competitive advantage for the firm, and most firms attempt to protect this information with great effort.

Firms protect information in an attempt to keep competitors uncertain on how and what serves as the firm's competitive advantage. A firm protects this information through internalization. Internalization limits outlets where information could be lost. Internalization helps reduce the risk of leakage by having control over information and production process. Reliance on other vendors in the market may come at the cost of sacrificing trade secrets or strategy.

There are several ways a firm can protect competitive and essential information such as using internal controls. Another protective measure is a non-compete clause for employees who are well informed of the overall process. A non-compete clause legally restricts a former employee from competing directly with a former employer. Evidence of firms using these approaches is abundantly evident.

Expansion helps to protect information by isolating employees', other than management, from accessing large amounts of information about the firm. Hence, by design, upper management is the only holder of all information (see Appendix). Isolation can be accomplished by creating divisions that limit a nonmanagement employee's ability to gain information on the entire firm. Firms intentionally create barriers to

prevent some employees from gaining sensitive proprietary information. These barriers are either physical, such as separate locations, or intangibles, such as limiting the duties of the employee to short interactions with the production process. By using transfer pricing, the firm can be more confident information is not spread easily. As the firm protects its information, it is increasing the certainty it remains competitive and ensures that competitors remain uncertain on knowing how to compete against the firm.

3.5 Taxation

The last transaction cost that Coase discussed is taxes. Coase hypothesized the ability to circumvent taxes is a major factor that leads to firms expanding. He argues reducing transactions costs are accomplished through creation of an internal exchange, where the firm is able to exchange goods tax-free. Although this argument is true, business-to-business goods that are not final goods are often sold without sales tax. The consumer often pays the sales tax. It would largely depend on if the firm is buying goods for further production or end use in order to capture the benefit theorized by Coase. Many of the other jurisdictions outside the United States use the value-added tax. In this case, it could potentially be more advantageous to buy rather than produce depending on the cost to produce. This is because value-added tax is charged at each interval of production and the producer must pay this tax.

However, income tax strategies are different and firms using the "check the box regulation" can lower their overall tax liability by electing how they wish to be classified. Some firms use this regulation to shift profits offshore into lower tax districts through acquisition of subsidiaries or creating businesses on foreign soil. Although there are

strategies that firms can use, it can take a great amount of effort for firms to exploit tax loopholes that may be temporary. Firms must be stable and certain that pursuing these strategies are worth the effort because tax policies and tax strategy can change.

Another aspect of taxes that make the exchange fall under the scope of uncertainty is that taxation is a forced exchange between government and the firm. Even though it is a forced exchange, firms attempt to maximize profit by minimizing tax liability as previously mentioned.

Taxes naturally have a shroud of uncertainty. There are legal, unscrupulous and even illegal ways a firm can reduce tax liability. Sometimes there are mistakes. Whether the mistake is unintentional or intentional, the shroud of uncertainty sometimes makes the transaction unclear. The nature of taxes creates high levels of uncertainty and both parties have different levels of information. The firm, however, interprets the required exchange and decides what to pay based on the information.

Furthermore, because of uncertainty, firms are able to approach taxes properly or dishonestly. Whether the taxes are done legally or illegally is up to the firm. The government holds the power of consequence. The government can audit the firm and verify the accuracy of the information and impose consequences if the information is incorrect. Nevertheless, the firm remains in a fixed exchange with the power to make the first move. Even under tax audit, the firm controls the information. Thus, the evaluation of risks and benefits of the exchange are entirely up to the firm.

CHAPTER 4

THE ROLE OF INFORMATION IN FIRM DEVELOPMENT

In this chapter, we will develop a theory of the firm using information. To do this, we will first examine certainty and uncertainty and how they relate to information. Then we will discuss how expansion develops information. The chapter concludes with discussing operational intelligence and stability. Both operational intelligence and stability are inherent traits of a firm and used to describe the firm from two broad measures.

4.1 Certainty and Uncertainty

In Coase's hallmark paper "The Nature of the Firm," (1937) he argues against the economic perspective of Professor Knight. One topic discussed is the role uncertainty has on firm development. Professor Knight (1921) argues the presence of uncertainty within the marketplace means it is not always clear what the market wants or does not want. Hence, the entrepreneur is willing to bear the risk and forecast the needs of the market. Under this system, Knight argues "the confident and venturesome assume the risk or insure the doubtful and timid by guaranteeing to the latter a specified income in return for an assignment" (Coase, 1937, p. 400). Knight argues there is a special class of

individuals within an economic system and are able to forecast the needs of the market. Coase rebuttals Knight on three fronts: some contracts are created without forecasting, coordination would still be necessary without uncertainty, and Knight fails to "give a reason why the price mechanism should be superseded" (Coase, 1937, p. 401). Unsatisfied with Knights argument, Coase then sought to explain the firm development through transaction costs. Even though Coase dismisses Knight's approach in explaining uncertainty in firm development, Coase acknowledges, "it seems improbable that a firm would emerge without the existence of uncertainty" (Coase, 1937, p. 392). This thesis continues some of the ideas of both of these economists.

Coase was correct in observing that firms wish to save money and in many cases do internalize, but this fails to explain the cases when a firm does not try to lower transaction costs. Such a case may be to protect information or the expansion required does not match the firm's operational goals. Furthermore, we discovered transactions are based largely on information. Hence, this is why it is necessary to develop a theory of the firm based on information. We will discuss this theory according to two perspectives. The first is the perspective of the entrepreneur or decision-maker(s) and assign a level of certainty. If the entrepreneur has high information regarding the area of business, then they would likely have high certainty. If they have low information, it would mean uncertainty. The second perspective is from the firm. This is an abstract way to apply this idea and is almost as if the firm was a machine. If the firm is functioning properly and has great human assets, then it is likely the firm is operating with certainty. If the firm is running poorly, then it has uncertainty.

Certainty and uncertainty are critical to classifying how information is impacting

the firm. We assign the information level to the two perspectives, entrepreneur and firm, because they describe how well the firm is doing. Uncertainty does not necessarily mean a firm will fail or is near the end, it just means that operations are vulnerable.

Uncertainty comes in two forms, internal and external. Both internal and external can be applied to the two perspective. Internal means that future events or even how to accomplish a task are currently difficult or impossible. Hence, much of what is necessary to overcome is experience. Uncertainty is having no prior or statistics of the past experience and has no basis to develop probability (Knight, 1921, p. 233). Uncertainty is being unaware and unable to anticipate future events and outcomes. Uncertainty and certainty is the framework of this theory and as firms shift between certainty and uncertainty. Additionally, the capacity of the firm to grow increases with certainty and shrinks with uncertainty.

4.2 Expansion Is Key to Developing Information and Stability

A firm often starts as an idea by an entrepreneur. The entrepreneur believes there is a need not being met in the market. Hence, the entrepreneur develops a way to produce that good or service for the market. This idea could have been developed from countless ways, such as schooling or experience, but comes down to application of information collected by the entrepreneur. This is very important for this new idea about firm theory because the entrepreneur is basing the decision to start a firm on information collected. Also, the information that has been collected suggests the market wants what the firm is selling.

Frank Knight argued it well, “at first sight it would appear that the consumer

should be in a better position to anticipate his own wants than the producer to anticipate them for him, but we notice at once that this is not what takes place. The primary phase of economic organization is the production of goods for a general market, not upon direct order of the consumer" (Knight, 1921, p. 240). Previously, when we discussed Coase, he suggested that firms supersede the price mechanism. Therefore, if the entrepreneur is able to produce demand, then the entrepreneur can supersede demand and dictate consumer wants. This is accomplished through operational intelligence.

4.2.1 Operational Intelligence

Operational intelligence is the first of the major traits of a firm and has been alluded to throughout this thesis. It is the collection of information held by the firm. It encompasses all data held by the firm, experiences, and knowledge of the workers. It also extends to how well the firm executes goals and strategy. It includes things such things as communication and the physical infrastructure. Operational intelligence also helps the firm recognize how to protect itself from internal and external threats. Operational intelligence also helps direct the firm so the firm is not adversely harmed. Operational intelligence can also be good in some areas of the firm and poor in other areas. Depending on how the firm is overall can either increase or inhibit the firm's ability to excel.

As we have seen, operational intelligence is many things, but it all comes back to being based on information. Operational intelligence is how proficiently the firm is operating. We will cover a few examples to show how it is based around information. Suppose a firm has a pyramid chain of command, it may be missing out on opportunities

because of communication restrictions. This firm would have lower operational intelligence. Another example is a firm that has highly trained employees and keeps these employees informed and educated on the firm's goals and direction. This example suggests the firm has good operational intelligence. Suppose a firm has gathered large amounts of data on market research and knows how to interpret the data. This firm has a strong area of operational intelligence.

A firm can have a competitive advantage over competitors because of operational intelligence. A competitive advantage occurs when a firm may have certainty regarding how to allocate resources and market participants outside of the firm are uncertain. If the market participants are uncertain, then the firm has a competitive advantage until the information is lost to the market. For example, suppose a firm developed a sophisticated product and only the firm knows how to produce it. The firm will have an operational intelligence advantage as long as the idea is not lost or replicated.

Protecting information is critical to the success of the firm. An example demonstrates this idea well. Suppose a firm has a very high profit margin and customers discovered this high profit margin. The customers would likely pressure the firm to lower the price of the good. The customers may even pressure the firm to a zero profit position. Profit provides liquidity and future growth opportunity for the firm. Regardless of the opinion about profit margin, this idea that a firm could lose competitive advantage through leakage of information is apparent. As Riley and Hirshleifer point out "there is also the possibility of unintended dissemination, achieved by espionage or monitoring on the part of information-seekers-possibly leading to countermeasures in the form of security (secrecy-maintaining) activities by the possessors of information" (Riley, 2014,

p. 1398).

It is important to note that information is still disseminated to the market by the firm such as marketing products or services, but a firm with has low leakage of information is assumed to have greater control over information. A firm can even design the physical or political structure of the firm to limit information loss. The basic point of controlling information is that a firm can maintain a higher operational intelligence when it is able to keep information in the firm.

4.2.2 Stability

Stability is the other major trait of the firm. It includes things such as external factors that cause instability or accurate forecasting that promotes stability. Much of what determines stability is how well a firm can anticipate future events and adjust or avoid these events through operational intelligence. Hence, a stable firm is able to prepare and carry out a plan according to expectations.

4.3 How Expansion Increases the Capacity of Operational Intelligence and Stability

Operational intelligence and stability increase from expansion because it adds more experience and knowledge, which increases the capacity of the firm to handle business. When internalization occurs, the purchasing firm now has access to strategy and information relative to the purchased firm's market. With this information, a firm may have clarity on how to reduce costs in existing areas of operations to opportunities that the internalized firm recognized prior to acquisition. This is because information regarding a process tends to be less impaired and easier to access when internalized.

Hence, in an internal market, transaction costs are less likely to be driven up by impairment, which is a form of uncertainty. The firm is able to reduce costs through certainty gained. As previously explained, the certainty gained is either operational intelligence or stability or possibly both. These two areas are necessary for expansion to occur.

Added information protects the firm. To view this concept abstractly, not all uncertainty is equal. For example, two CEOs may have very different experiences with the market. Suppose an event happens; one CEO having experienced a similar event prior to the new supposed event was able to anticipate the risk. The other CEO has no prior experience that would help with the upcoming event and is left with uncertainty about how to manage the new event.

The other major way internalizing helps a firm is being able to control inputs in production. Internalization is a controlled economy for the firm and there are various things a firm can do within a controlled economy that would not be possible if the same transactions occurred on the market. Controlling the economy means a firm can control resources, internal prices, trade, and depending on contracts, alter production assignments.

Once the firm has expanded, it now controls aspects of operations that were internalized. Interestingly, Knight argued, "uncertainty could be reduce through consolidation" (1921, p. 260). This may explain why a firm is able to increase certainty during financially rough times by firing nonessential personnel. Knight's argument of consolidation reduces uncertainty; expansion is similar to consolidation in principle. Both eliminate surplus. Consolidation eliminates nonessential items and expansion

eliminates the need for external sources. Also, it is within the bounds of the argument that a firm would use operational intelligence to eliminate whatever is hindering the firm from reaching optimal performance.

CHAPTER 5

APPLYING INFORMATION TO FIRM EXPANSION

In this chapter, the factors of expansion and what limit expansion are discussed, followed by an overview of how these factors work together in determining whether or not the firm is likely to expand.

5.1 Factors of Expansion

5.1.1 Operational Intelligence

There are two major factors that determine the quality of operational intelligence. These factors are the quality of information efficiency and the capability of management to properly use that information. Both of these aspects of operational intelligence help the firm develop certainty that is not necessarily based on expansion. However, developing these may lead to the firm being able to further expand.

Information efficiency goes beyond traditional accounting data collection. This includes the intangibles of brainstorming to having homogeneous integrated software system. It is the accuracy to which information can be transmitted to management about the overall awareness and position of the firm. For example, suppose an assembly line worker at a widget factory recognizes a machine could double its production rate with a

small modification. Further suppose that the modification to the machine would be relatively cheap and the increased output would meet the market demand for the product. If the worker is unable to share this information with decision makers, it may take a long time for the decision makers to recognize the opportunity or, possibly, it may never be realized.

Information efficiency also incorporates the quality of information. If the worker cannot convey the message properly and uses esoteric terminology, management may be unable to recognize the opportunity. A firm that can convey ideas properly to decision maker's has better chances of determining the quality of information.

The capability of management was alluded to, but goes beyond recognizing opportunity. It extends to training management on the firm's specific market and working as a team. A manager may be highly capable, but if burdened with nonessential tasks, he may miss opportunities. For example, a firm uses handwritten reports rather than a computerized system and the report are collected and complied by the manager. The manager is wasting time and effort that could be saved through automation. Assuming that the firm could bear the financial cost of a computer system, it is not hard to imagine that the manager is wasting time, money, missing opportunities, and lowering the overall efficiency by not using computer technology.

In brief, the quality of the firm's operational intelligence is determined by the combination of these two elements, information efficiency, and capability of management. Both of these assist in proper allocation of resources, directing the firm to opportunity and to capture market share.

5.1.2 Ignorance, Misinformation, Incompetence

Furthermore, it helps management direct the firm away from hazards that could damage the firm. Three areas that work against operational intelligence are ignorance, misinformation, and incompetence. In general, these areas all reduce the quality and ability to make proper decisions. Ignorance may be the thought of as an individual or firm that is unfamiliar. This could be due to new responsibility that will require time to adapt and familiarize with the role. Uncertainty can be overcome through experience and training that help the individual pass through the learning curve to reduces ignorance.

Misinformation can occur from restricting information. Although isolating areas of the firm can help reduce leakage, it also can be a source of problems. When divisions within a firm are unaware of the overall production goal of the firm, each division is focused on its own profit maximization. This may be in the form of incentives or structures that cause individuals or divisions to cheat or pose moral hazard issues to the firm. This may not be in harmony with the overall goals of the firm. Each member of the firm has a limited perspective of their role within the firm.

Misinformation may arise from the intentional barriers set to divide divisions. Information that is sent to upper management may be specifically tailored to the division rather than the firm. If management of a division is incapable of distinguishing between good for the division and good for the firm, problems are likely to arise. As misinformation builds, it impairs decision-making and increases uncertainty for the firm. This can result in problems that lead to cannibalization of divisions.

The last area is incompetence. This includes the unwillingness to become more operational intelligent, leakage of competitive advantage, or the inability to understand.

Unwillingness may occur when management or individuals are stubborn to evolve with the direction of the firm. This may include an individual's resistance to adopt technology or even act in the best interest of the firm. Leakage of information can also cause problems because the firm can lose its competitive edge. The more departments in a firm that exchange specific information, the higher the chance of information leaking to competitors.

Incompetence may also be the inability to understand. This may be from a lack of proper training on how to do a job, language barriers between employees, or even the inability to think critically about the firm's needs. In many ways, the overall governance structure, policies, and personnel naturally restrict or enhance the flow of information throughout a firm.

5.1.3 Stability

Stability increases certainty for the firm. Stability increases as the firm's ability to accurately forecast the needs of the market, the needs of the firm, anticipate volatility, and how to allocate the resources of the firm from operational intelligence. Even if there is an occurrence of market turbulence, if a firm is able to anticipate shocks and fluctuations, it can be considered stable. Another aspect of stability is the financial soundness and integrity of the firm. A firm that is operating with high risk and threat of insolvency is less likely to be considered stable. Stability serves as a major key for a firm's willingness to expand.

5.1.4 Volatility

Volatility can impact the firm in two ways, externally and internally.

5.1.4.1 Volatility: External to the Firm

Volatility within the market is a significant reason to keep firms from expanding. Speculation and forecasting are estimates of the future. A firm has little control over the market and is subject to the volatility that occurs in market interaction. For example, a market that has constantly fluctuating prices for a good or services means that one or more resources in production is in an unstable state. This could be anything from a machine breaking down to shipping problems. Firms often operate better if stabile. A firm may not expand if it is in an industry that is extremely difficult to forecast. These businesses may be more reliant on vendors to assist in production in an attempt to maintain separation from volatility, but by doing so the firm is setting a firm boundary.

External volatility can manifest itself in three ways: market forces, technology, and government. Even if all of these inducers of volatility are external to the firm, they can still have significant impact to the firm.

Market volatility pushes well-established firms into conservative decisions even if volatility is minimal and unlikely to have significant impact to the firm. Market volatility induces panic and fear. Firms do what they must to stay in business and fear can prevent the firm from taking any actions that can jeopardize its solvency. This brings up an interesting dynamic of a potential firm relationship; upper management wants to keep their job and shareholders want greater return. Sometimes these motives run parallel, but in situations of volatility, the goals of the parties can be very different.

For example, during the most recent economic crisis Warren Buffet said "You make your best buys when people are overwhelmingly fearful" (Das, 2013). Buffet was referring to the financial crisis as a situation that induced panic and he was very candid about buying during the volatility. Buffet likely had high certainty throughout the volatility and was able to make purchases in a buyer's market. Hence, a point to be made is that being able to forecast with certainty negates volatility. Continuing on with the example, shareholders may have certainty in a direction the firm should move. The shareholders may pressure upper management of a firm to expand during volatility because they see the opportunity. Conversely, upper management may be very hesitant and uncertain and refuse to do anything that could create risk for the firm.

Risk may be viewed differently between shareholders and upper management. Risk for shareholders may result in an increase or loss of future earnings, whereas for upper management, the risk may result in a bonus or not having a job. If this is the case, it suggests that upper management may tend to focus on personal impact such as job loss or lower pay that may come from risky decisions. Hence, the firm may make conservative decisions even with the pressure from shareholders. This implies that both production and market volatility are enough to keep a firm from expanding and is a barrier to future growth.

It should also be noted that market volatility could influence decisions for the firm. It may be anything from over purchasing supplies to having multiple suppliers for the same supplies. Essentially, firms must hedge against market volatility because of having less control over suppliers. Inversely, if the firm expanded operations and bought the suppliers, incorporating the suppliers into production would increase control over

those supplies for the firm. If not incorporated, any transaction beyond the firms control has the potential to encounter volatility.

Technological changes are another source of volatility. A systematic change in technology can completely alter or destroy industries. For example, the newspaper industry has gone under significant changes from technological advancements. Continuing on with the newspaper industry example, the consumer delivery methods have changed and anyone can report the news. There are numerous options that never existed for consumers to get news. All of these technological changes forced news outlets to adapt and face new competition.

The government is another source of systematic change that can cause significant volatility for a firm. Laws and regulations can change how a business operates. For example, a coal power plant may be severally restricted on how it burns coal, or worse, it can be shut down because of pollution concerns. Although this may be a controversial example, it is meant to show how legislation can impact a business or even change the landscape of an industry.

Sometimes external volatility can have multiple sources simultaneously. A great example of this type of volatility is the most recent financial crisis where there was market volatility and government volatility. When Lehman Brothers went bankrupt, the banking industry as a collective was hit hard. As other banks began to show signs of weakness, the federal government intervened to calm and restore public confidence. Wells Fargo, Dimon & Blankfein, JP Morgan Chase, and Goldman Sachs were all insistent that they neither wanted nor needed TARP money as a result of the financial crisis (Blinder, 2013). Whether these banks really went unscathed from the banking

industry problems is unclear, but the government required them to take TARP money to stabilize the economy. In this example, you have one industry where some banks are impacted by the market, some impacted by government intervention, and others impacted by both.

5.1.4.2 Volatility: Internal

Internal volatility is often associated with poorly allocated resources. Coase explained that "diminishing returns [due to] management or rising supply prices" restrict expansion (1937, p. 396). Although, mismanagement can cause production problems and cause internal volatility for a firm, internal volatility is more encompassing. Some of the ways that a firm experiences internal volatility are production problems, scandals, information loss, language barriers, and poor management decisions.

Production problems may result from poor coordination between divisions or areas of operations. Although separation is used to protect information, if management fails to coordinate and establish a way to communicate, then the firm will have production problems. These separations can be physical or intangible such as policies. For example, bottlenecks may occur when a firm is trying to coordinate production over vast distances. Bad logistics can stifle production and cause volatility to increase costs for the firm. Production volatility is especially dangerous for a firm because it increases overall costs and can cause problems for the rest of the firm down the production chain. Suppose a firm produces computers. Each division produces one component of a computer. The divisions send the components to the next assigned division. If production fails along the product line it can impact all areas of the firm. As Bauer points

out, “production in general takes time so that firms need to make detailed forward plans for the supply of commodities without the benefit of forward commitments to buy on the part of consumers” (Bauer, 2005, p. 5). Hence, bottlenecks can further exacerbate problems for the firm because delaying the production of goods for uncommitted consumers may further diminish possible sales.

Alternatively, if the problem is near the end of production, then the previous divisions continue producing and the affected division may be required to hold excess inventory. In this case, bottlenecks increase the costs of production, storage, and waste. Firms that are prone to volatility issues, whether it is production or any others problems within the firm, have higher risk. Hence, risk can limit expansionary attempts by the firm.

Scandals can be another source of internal volatility. Whether the scandal occurs in the firm or another firm, because of interactions, the firm may have problems. For example, an accounting firm has high interaction between its clients. Suppose one of the clients held by the firm was investigated for fraudulently conducting business. It is extremely likely that the accounting firm will come under extreme scrutiny by the law. Even if the accounting firm can immediately prove that it did everything in its power to do a thorough and lawful audit, the accounting firm will still come under scrutiny by the law and public. This external scandal would likely bring high levels of uncertainty about the operation and finances of the accounting firm. The uncertainty of the outcome can force the firm to be conservative. Hence, the result of the scandal at another firm brought uncertainty to the firm even though the accounting firm was diligent in practice.

Losing information is another area that can cause internal volatility. This could

be losing data or losing a key employee. Losing information is a big problem because it could impact the firm's relation to customers or increase competition. Similarly, losing key employee is potentially more threatening to the firm because the former employee has information and can be an asset for a competitor. When both aspects of losing information are lost to competitors, then the competitive advantage is greatly diminished or nonexistent.

Language barriers are also another source of internal volatility. If there are language barriers and no way for employees to communicate, then the firm can have volatility. Although we tend to think of language barrier such as dialect, it also extends to training. Suppose that a hospital hires a new emergency room assistant. If one day, the doctor asks for a specific tool and the new assistant does not know which tool the doctor is describing, then there could be serious problems. Firm language exists, and if a firm fails to train employees on specific terms, it can result in problems.

Lastly, management's poor decisions or lack of competence can also impact the stability of the firm. Management can poorly allocate resources, assign duties inefficiently or hire the wrong people. Many of these may come to mind when we think of poor decisions. An example that may not be so apparent is missed opportunities.

Oftentimes we would expect that a competitor failing would create a vacuum that would be quickly filled with the failed firm's competitors, but this is not always the case. A firm may miss the opportunity. Suppose there are three firms "A", "B", and "C" competing against many other firms in an industry. The difference is that "A", "B", and "C" tend to compete head to head more often and have similar market share. Suppose as "B" fails, "C" tenaciously goes after the market share formerly controlled by "B".

During this process, “A” is unable to see the potential and does nothing. Although the opportunity was there for “A”, management failed to see the opportunity.

CHAPTER 6

EXPANSION OR FIRM BOUNDARY

In this chapter, we will apply the ideas from the previous chapter and determine whether a firm is likely to expand or not given the conditions of the environment. Certainty assumes that the firm has operational intelligence, stability, or both. Uncertainty assumes that the firm has volatility, lacks information, or both. It is even possible that a firm has a combination of certainty and uncertainty. Figure 1 illustrates the relationship[31] between certainty and uncertainty.

6.1 Overview of the Conditions of Expansion

6.1.1 Quadrant I - Strategic Expansion

In this quadrant, the firm is more likely to expand because it has good operational intelligence and is stable. This is the ideal situation for expansion because the firm is able to more accurately anticipate outcomes from operational decisions. Firms in this

[31] I would like to suggest that Figure 1 is also applicable in explaining how entrepreneurs develop. An entrepreneur within the context of operational intelligence (understanding market demand) and stability (financing accessibility) explains why some individuals are entrepreneur and other are not. Within the context of Figure 1, it makes more sense of how some individuals are capable of being entrepreneurs and others are not.

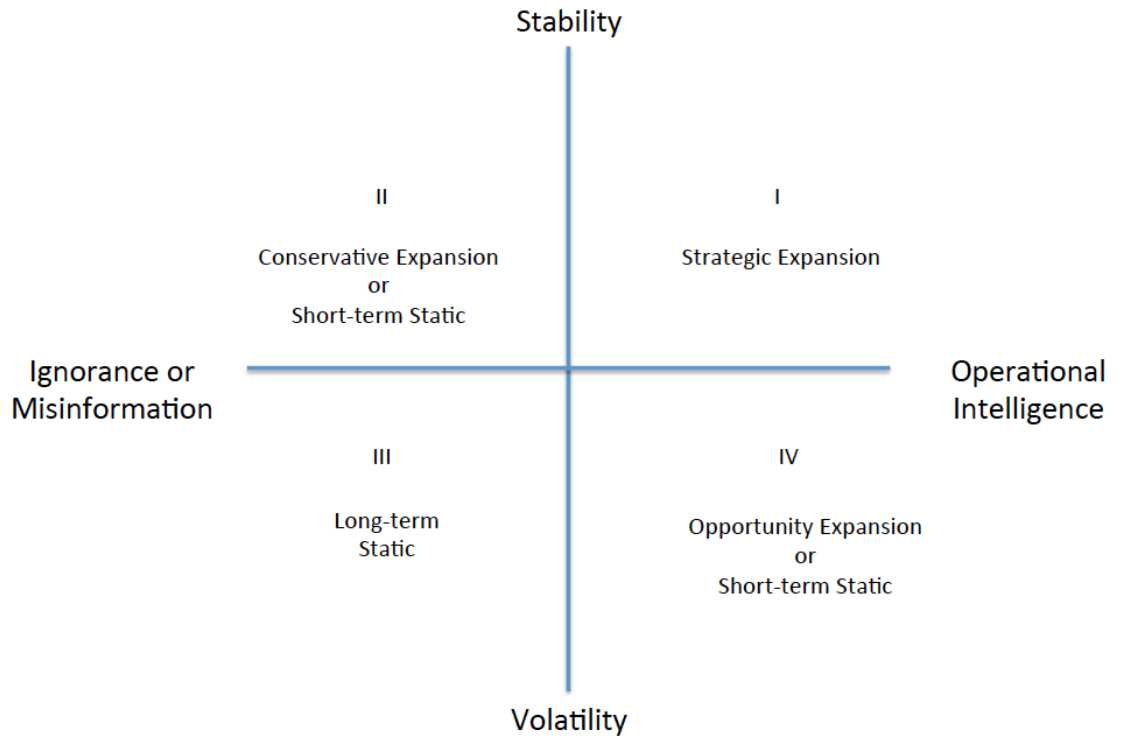

Figure 1. The relationship between certainty and uncertainty expressed in terms of Stability and Volatility versus Misinformation and Operational Intelligence.

quadrant are more likely to be able to take on large financial obligations potentially required for expansion. Also, the firm can more easily recognize opportunities. Whether the opportunities recognized are potentially lowering transaction costs or increasing market share, upper management is able to consider the likelihood of success and benefit.

6.1.2 Quadrant II - Conservative Expansion

In this quadrant, the firm is less likely to expand because the firm lacks clarity. Expansion is risky and lacking clarity accentuates the riskiness of expansion. Even though the firm is in a stable state, the uncertainty arising from a lack of information may cause the firm to temporarily refuse to expand until information is gained or developed. The other option is that the firm expands in a very conservative fashion with limited

investment and financial commitments. In this quadrant, the firm sets the firm boundary. It is likely that the firm maintains the firm boundary until it is able to develop or gain better information.

6.1.3 Quadrant III – Long-Term Static

In this quadrant, the firm is unwilling to expand. The risk from volatility and lacking information makes any expansion highly risky. The firm remains in this state until the firm is unable to anticipate volatility or develop operational intelligence. In this quadrant, the firm sets the firm boundary. It is likely that the firm remains with the current boundary until it develops information or there is greater stability.

6.1.4 Quadrant IV - Opportunity Expansion

In the last quadrant, the firm is similar to quadrant II in that expansion may be temporarily refused, but with respect to volatility. The firm may be forced to wait until the volatility has dissipated. If the firm does decide to expand, it is because the firm has clarity to recognize opportunity. However, it should be noted that not all volatility is similar and the intelligence must be specific to the opportunity. In this quadrant, the firm likely remains at the current boundary until the firm sees an opportunity in the volatility.

CHAPTER 7

THE CASE FOR UNCERTAINTY IN FIRM BOUNDARY

In the previous chapter, "Overview of Firm Expansion", we discussed how certainty leads to firm expansion. Uncertainty, therefore, limits expansion. A firm's inability to expand is linked to volatility or issues such as lack of proper information. Ultimately, the firm has limited expansion ability due to these issues and the firm boundary is determined. I would like to clarify that the firm boundary is not permanent and may change over time. The boundary can change according to the firm's ability to manage volatility or develop information. The firm may increase or decrease in size due the market environment or where the firm is on its lifecycle. The firm boundary may change as the firm gains operational intelligence, experiences stability, or both. Consequently, because the firm boundary can change, there is a distinction between short-term and long-term period where the firm may remain static because of the varying levels of certainty (Refer to Figure 1).

CHAPTER 8

CONCLUSION

The role of information is essential to firm theory. Both uncertainty and certainty do an excellent job describing the state of the firm. Information explains why firms expand or cease expansion. It describes the dynamics of how a firm functions and how decisions are made.

The desire to overcome uncertainty cannot be understated. Uncertainty can cause a firm to make poor decisions and allocate resources wastefully. Certainty counteracts the paralysis of uncertainty and helps the firm make better and more informed decisions. Certainty also helps the firm optimally allocate resources. A firm with high certainty, operational intelligence, and stability will continue to expand. A firm with uncertainty, instability, and a lack of information will cease expansion and establish a firm boundary.

Expansion can increase certainty to the operational intelligence and stability of the firm by adding resources. The firm naturally generates these forms of certainty through experience or expansion. Expansion increases resources for the firm and the capacity to develop certainty. Another potential benefit of expansion is more control over the total production process resulting in the firm becoming less reliant on the market. As a result, expansion can add stability to the firm. Stability and operational

intelligence increase the firm's ability to gain market share, develop a competitive advantage, and maximize profits.

The dynamics of a theory of the firm based on certainty and uncertainty is interesting because it offers a broader perspective of the firm in its current operation and position in the lifecycle. It helps to explain the motives of why a firm wishes to gain certainty, from an economic and strategic perspective. It also helps explain why firms cease expansion or make conservative decisions. For these reasons, a more diligent look at information and its role in the theory of the firm is necessary.

APPENDIX

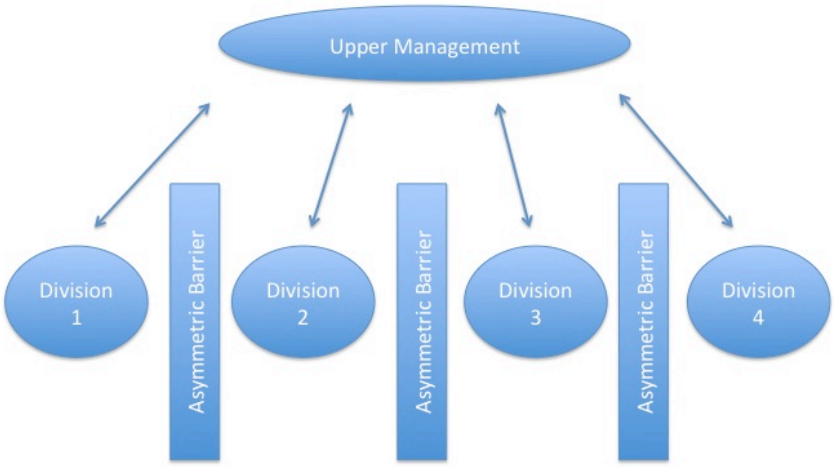

Figure 2: The relationship between divisions and upper management.

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